

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

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To:

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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/JP2005/006810

International filing date (day/month/year)
31.03.2005

Priority date (day/month/year)
31.03.2004

International Patent Classification (IPC) or both national classification and IPC
H03H9/17

Applicant
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1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITYInternational application No.
PCT/JP2005/006810**10/552582****Box No. I Basis of the opinion**

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/JP2005/006810

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	10-12
	No: Claims	1-9
Inventive step (IS)	Yes: Claims	
	No: Claims	10-12
Industrial applicability (IA)	Yes: Claims	1-12
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V.

V.1 Prior Art.

In this communication the following document, cited in the search report, will be referred to: The numbering will be maintained throughout the proceedings:

D1: US5864261

V.2 Deficiencies

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-9 is not new in the sense of Article 33(2) PCT.

V.2.1 Using as far as possible the wording of claim 1, document D1 discloses the following; the references in brackets referring to the document D1:

An acoustic mirror type thin film bulk acoustic resonator comprising:
a substrate (Fig. 1, ref. 20);
an acoustic mirror layer provided on the substrate (Fig. 1, ref. 40), including a plurality of impedance layers alternately having a high acoustic impedance and a low acoustic impedance (col. 5, lines 15-22, in particular lines 21,22); and
a piezoelectric thin film vibrator (Fig. 1, ref. 30) provided on the acoustic mirror layer, including a lower electrode (Fig. 1, ref. 37), a piezoelectric thin film (Fig. 1, ref. 35) and an upper electrode (Fig. 1, ref. 36), wherein, since the thickness of the piezoelectric film is 0.9 μ m (col. 7, line 54), the sum of a thickness (0.3 μ m, col. 7, line 57) of the lower electrode and a thickness (0.2 μ m, col. 7, line 54) of the upper electrode is 35,71% of a whole thickness of the piezoelectric film vibrator, and
the thickness of the lower electrode is larger than the thickness of the upper electrode.

Since all features of claim 1 are known from the document D1, the subject matter of the claim is not new, Article 33(2) PCT.

V.2.2 Claims 2 and 3 are not new (Article 33(2) PCT) because each of the plurality of low acoustic impedance layers of the thin film bulk acoustic resonator of D1, including the uppermost one which contacts said lower electrode, has a thickness of one fourth of the acoustic wavelength defined from the frequency in free space of the piezoelectric thin film resonator (col. 7, lines 36-40).

V.2.3 Claims 4-9 lack novelty (Article 33(2) PCT) because thickness tolerances are inherent to the film deposition techniques required to fabricate the claimed acoustic mirrors. Mirrors having acoustic impedance layers with more or less than a quarter of the relevant wavelength are therefore implicitly disclosed with the disclosure of thin film bulk acoustic resonator mirrors having $\lambda/4$ layers.

V.2.3 Even if the subject-matter of claims 4-9 was restricted by further specifying the amount of differences of the acoustic impedance layer thicknesses to a $\lambda/4$ reference value, claims 4-9 would still lack an inventive step in the sense of Article 33(3) PCT for following reasons:

The skilled person wanting to implement an acoustic mirror for a thin film bulk acoustic resonator like the one described in D1 knows that the $\lambda/4$ condition must be met with respect to the acoustical velocity in the given mirror layer (D1, col. 5, lines 1-3).

Depending on the choice of materials for said mirror layers, a straightforward application of this knowledge leads to mirror layer thicknesses of more or less than one fourth of the acoustic wavelength defined from the resonant frequency in free space of the piezoelectric thin film vibrator as claimed.

V.3 Remaining Dependent Claims

- The dependent claims 10-12 appear not to claim any additional features which render them either new or non obvious with respect to the available prior art, because filters, duplexers and communication apparatuses are devices in which the thin film bulk acoustic resonator of D1 would normally be applied.